Work functioning in cancer patients: looking beyond return to work

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Work functioning trajectories in cancer patients: results from the longitudinal Work Life after Cancer (WOLICA) study

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CHAPTER 4

Abstract

Introduction: More than 60% of cancer patients are able to work after cancer diagnosis. However, little is known about their functioning at work. Therefore, the aims of this study were to 1) identify work functioning trajectories in the year following return to work (RTW) in cancer patients and 2) examine baseline socio-demographic, health-related and work-related variables associated with work functioning trajectories.

Materials and methods: This longitudinal cohort study included 384 cancer patients who have returned to work after cancer diagnosis. Work functioning was measured at baseline, 3, 6, 9 and 12 months follow-up. Latent class growth modeling (LCGM) was used to identify work functioning trajectories. Associations of baseline variables with work functioning trajectories were examined using univariate and multivariate analyses.

Results: LCGM analyses with cancer patients who completed on at least three time points the Work Role Functioning Questionnaire (*n*=324) identified three work functioning trajectories: "persistently high" (16% of the sample), "moderate to high" (54%) and "persistently low" work functioning (32%). Cancer patients with persistently high work functioning had less time between diagnosis and RTW and had less often a changed meaning of work, while cancer patients with persistently low work functioning reported more baseline cognitive symptoms compared to cancer patients in the other trajectories.

Discussion: This knowledge has implications for cancer care and guidance of cancer patients at work.

What is new? Within 1-2 years of cancer diagnosis, more than 60% of cancer patients RTW. Little is known, however, about patients' perspectives on work or how well they are able to perform their jobs. In this study, cancer patients who returned to work were followed for 12 months after RTW. Three work functioning trajectories were identified: persistently high, moderate to high and persistently low. The latter category included one-third of the patients. Major factors associated with work functioning included time between diagnosis and RTW, cognitive symptoms and changed meaning of work.

Introduction

Owing to improvements in cancer detection and treatment, survival rates of people diagnosed with cancer are increasing[1,2]. A substantial proportion of cancer patients (64%, range 24-94%) return to or stay at work[3], trying to maintain their everyday-life and social relations[4,5]. Several studies have addressed the employment consequences of cancer survivorship in terms of employment status[6-11]. A recent study in occupationally active cancer patients up to four years after diagnosis showed that good work ability was associated with work continuation[12]. An in-depth review by Munir et al. showed that cancer patients reported lower work ability, compared to healthy controls or those with other chronic conditions[13]. Although variations in work ability were found across cancer types due to used study designs and used measures[14-16], no clear conclusions could be drawn. Possible explanations for the differences across cancer types and work ability could be disease severity, treatment-related factors and work-related factors.

When back at work, cancer patients often have to cope with declined physical and cognitive capacity, emotional concerns, self-confidence issues, a limited understanding of the effects of cancer by colleagues and employers and sometimes changes in the work environment[17,18.] Return to work (RTW) might therefore be seen as a process rather than a state, with health-related work functioning (hereafter referred to as work functioning) as a highly valuable outcome. Work functioning moves beyond employment status as it provides detailed information about experienced difficulties in meeting the demands of work given a health status[19-21]. However, few studies have looked into work functioning in cancer patients[22-24].

Previous US research showed that brain tumor survivors reported lower work functioning levels compared to a non-cancer group[22]. In addition, breast cancer survivors reported higher levels of work limitations compared to a non-cancer group[23,24]. The cross-sectional design of these studies does not allow to look into the course of work functioning or to detect distinct trajectories of work functioning after RTW. Moreover, knowledge about variables associated with high and low work functioning levels over time is lacking, but needed to inform the care process and to support better patient-centered outcomes. To our knowledge, there are no longitudinal studies investigating the course of work functioning after RTW of cancer patients. Therefore, this study aims to 1) identify work functioning trajectories

in the year following RTW of cancer patients and 2) examine baseline socio-demographic, health-related and work-related variables associated with work functioning trajectories.

Materials and methods

The Dutch social security system

While some employees are able to stay at work after being diagnosed with cancer, other employees are sick-listed during and/or after their treatment. In the Netherlands, sickness absence is compensated by the employer for two years. Employers can insure sickness absence compensation, and in that case, sickness benefits are paid by the employer's insurer. Employees report sick to their employer, who sends a sick-report to the Occupational Health Service (OHS) to start medical guidance. Sick-listed employees are seen every 4-6 weeks by an Occupational Physician (OP), who advises the employee and employer about work accommodations and other measures to facilitate RTW.

Study design and sample

The Work Life after Cancer (WOLICA) study is an 18 months longitudinal cohort study among cancer patients aged 18-65 years who had resumed work at least 12 hr/week (during or following cancer treatment). From the moment cancer patients resumed work for ≥12 hr/week, they were eligible for inclusion in WOLICA within 3 months. Cancer patients were excluded from WOLICA if they 1) had no paid employment for at least 1 year prior to cancer diagnosis, 2) had recurrent cancer, 3) were treated with palliative intent/hospice care, and 4) were unable to complete a questionnaire in Dutch.

Potential participants were identified and informed about the study during a regular visit in the RTW process with their OP. The OPs were working at three national OHS in the Netherlands, responsible for ~3 million (33%) of the 9 million Dutch workers. When cancer patients were able to (return to) work for ≥12 hr/week, the OP informed the patient about the WOLICA study. If patients were interested to participate in the WOLICA study, OPs forwarded the patient's name and address to the research team. Cancer patients were called and those who met the inclusion criteria received additional study information, an informed

consent form and a baseline questionnaire. Patients had to return the baseline questionnaire and informed consent to the research team within the first three months after RTW for ≥12 hr/week. Patients who did not return those materials received a reminder after 3-4 weeks.

Participants were followed for 18 months and received follow-up questionnaires every 3 months, measuring socio-demographics, health-related and work-related variables. At baseline, and 6, 12, and 18 months after RTW, major study concepts were assessed using a comprehensive questionnaire (completing in ~20-30 min). Short questionnaires were sent 3, 9 and 15 months after RTW, including the main outcome measures (completing in ~10 min). Online questionnaires were digitally received by the research team, and paper questionnaires were returned by mail. Participants completed the questionnaires at home and received no incentive for participation. WOLICA was reviewed and approved by the Medical Ethical Committee of the University Medical Center Groningen (M12.125242).

Between March 2013 and July 2015, *n*=516 interested cancer patients were contacted for participation. After applying the inclusion criteria, *n*=39 were not eligible, *n*=13 could not be reached and *n*=1 had died. The baseline questionnaire was sent to *n*=463 cancer patients and a total of *n*=387 patients (84% of 463) returned a completed questionnaire. The main reason for non-response was “no time to complete the questionnaire”. After completing the baseline questionnaire, another three participants were excluded, because RTW was longer than 3 months ago. The final WOLICA cohort consists of 384 cancer patients. For the current study, baseline data and 3, 6, 9 and 12 months follow-up data were used. Cancer patients were included in the analysis if their work functioning scores were available for at least three of the five assessments points, which reflect a meaningful time span to calculate individual work functioning patterns. Sixty cancer patients (16%) had work functioning scores on less than three of the five assessment points and were excluded from our analyses. Twelve of them (20%) were not working for ≥12 hr/week on three or more of the five assessment points. Forty-eight cancer patients were loss to follow-up: *n*=15 (25%) after completing the baseline questionnaire and *n*=33 (55%) on a later time point. The analytic sample therefore consisted of *n*=324 cancer patients.

Measures

Work functioning was measured with the 27-item Work Role Functioning Questionnaire (WRFQ 2.0)[25], a questionnaire designed to measure difficulties in meeting work demands perceived by workers with physical health problems or emotional problems in the past 4 weeks. Example items are: I found it difficult to "work the required number of hours", "work fast enough", "bend, twist, or reach while working" or "concentrate on work". Response options range from 0=difficult all of the time to 4=difficult none of the time. The response option "Does not apply to my job" was added to enable cancer patients to answer, even when a particular demand was not relevant to their job. In the analyses, "does not apply to my job" was coded as missing. If answers on 20% or more of the items were missing, the WRFQ total score was set to missing. Total WRFQ scores were calculated by summing the scores on each item, divided by the number of items and then multiplying by 25[25]. Total WRFQ scores ranged from 0 to 100 (Cronbach's alpha α=0.96), with higher scores indicating better work functioning. WRFQ scores can be classified as "high" (>90), "moderate" (75–89) and "low" (<75). Owing to a lack of cutoff values in cancer patients, the classification was based on existing literature in patients with musculoskeletal disorders[26]. For completing the WRFQ, participants need to be currently employed and working for ≥12 hr/week. However, several cancer patients completed the WRFQ while not working at that moment. It was decided to use the WRFQ scores of cancer patients absent for <2 weeks in the past 4 weeks (*n*=21). WRFQ scores of cancer patients absent for >2 weeks were set to missing (*n*=31).

Based on the Cancer and Work model[27], baseline socio-demographic, health-related and work-related variables were selected to examine the association with work functioning trajectories. Socio-demographic variables comprised age (in years), gender (male; female), level of education (low, i.e., primary, junior secondary vocational and junior general secondary education; medium, i.e., senior secondary vocational education and senior general secondary education; high, i.e., higher professional education, college and university) and marital status (married/cohabitating; single/divorced).

Health-related variables included cancer site, treatment (surgery; radiotherapy exclusively, or in combination with surgery; systemic therapy (i.e., chemotherapy, immunotherapy, hormonal therapy, stem cell transplantation and/or bone marrow transplantation) exclusively, or in combination with radiotherapy and/or surgery), treatment completed (yes; no), treatment side effects (yes; no), co-morbidity (i.e., cancer with at least

one other disease, e.g., musculoskeletal disorder, cardiovascular disease, diabetes, yes; no) and time between cancer diagnosis and RTW for at least 12 hours per week (in months).

General health was measured with the single SF-36 item "In general, how would you rate your health?"[28]. The response options range on a five-point scale from 0=excellent to 4=poor. Scores were dichotomized excellent-good; fair-poor.

Quality of life was measured with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ), subscales "physical functioning" and "role functioning" (5 items, α=0.68, 2 items, α=0.54)[29]. Response options range from 1=not at all to 4=very much. Total scores were calculated by summing the scores on each item, divided by the number of items and then multiplying by 25. Total scores ranged from 0 to 100, with higher scores indicating a better quality of life.

Work-specific cognitive symptoms were measured with the Cognitive Symptom Checklist-Work Dutch Version (CSC-W DV) (19 items, α=0.95)[30]. Response options range from 0=never to 4=always. Total scores were calculated by summing the scores on each item, divided by the number of items and then multiplying by 25. Total scores ranged from 0 to 100, with higher scores indicating more cognitive symptoms (i.e., more limitations).

Fatigue was measured with the Checklist Individual Strength (CIS-8), subscale "fatigue severity" (8 items, α=0.88)[31]. Response options range from 1=yes, that is true to 7=no, that is not true. Total scores were calculated by summing the scores on each item. Total scores ranged from 8 to 56, with higher scores indicating more severe fatigue. A score of >35 was indicative of severe fatigue.

Depressive symptoms were measured with the Patient Health Questionnaire-9 (PHQ-9) (9 items, α=0.88)[32,33]. Response options range from 0=not at all to 3=nearly every day. Total scores were calculated by summing the scores on each item. Total scores ranged from 0 to 27, with higher scores indicating more depressive symptoms.

Several work-related variables were included. Job title was based on two self-formulated open questions on working title and main tasks. Jobs were classified according to the International Standard Classification of Occupations (ISCO-08)[34], a main international classification tool for organizing jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job.

Job type was based on a self-formulated question “What tasks do you perform in your current work?” (manual, i.e., mainly physical tasks; nonmanual, i.e., mainly psychological (mental) tasks; both manual and nonmanual, i.e., both psychological (mental) and physical tasks).

Working hours were measured per week. Employment contract was based on a self-formulated question “What kind of employment contract do you have?” (permanent; temporary; other). Company size was based on a self-formulated question “How many people are employed at your company?” (1-9 persons; 10-49 persons; 50-99 persons; 100-499 persons; 500+ persons). If their company has more than one establishment, participants had to give only the number of employees of the location in which they are working. Tenure with current employer was based on a self-formulated question “How many years have you worked with your current employer?” (≤5 years; >5 years). Breadwinner status was based on a self-formulated question “Are you the main breadwinner? That is, are you the one who has the highest income?” (yes; no; equal with partner).

Reason for RTW was based on a self-formulated open question “What is the main reason for RTW?” (treatment completed and/or healthy; economic or pushed by others; structure, back to normal, colleagues; other reasons). Perception regarding RTW moment was based on a self-formulated question “How did you perceive the moment of your return to work?” (right moment; too early; too late).

Work accommodations were based on a self-formulated question “Do you currently have work accommodations because of your health?” (yes; no). Cancer patients who reported to have a work accommodation were asked to specify their work accommodation (fewer working hours; more breaks, flexible/other schedule; less physical demands; other function or tasks; other work accommodation).

RTW with same employer was based on a self-formulated question “Did you RTW with the same employer?” (yes; no). RTW with same colleagues was based on a self-formulated question “Do you currently have the same colleagues as before cancer diagnosis?” (yes; same and others; others).

Social support was measured with two subscales of the Copenhagen Psychosocial Questionnaire (COPSOQ), “Social support from the supervisor” (2 items, α=0.79) and “Social support from colleagues” (2 items, α=0.70)[35]. Response options ranged from 0=never/hardly

ever to 4=always. Total scores were calculated by summing the items. Total scores ranged from 0 to 8, with higher scores indicating more social support.

Sense of community was measured with the Copenhagen Psychosocial Questionnaire (COPSOQ), subscale "Sense of community" (3 items, α=0.86)[35]. Response options ranged from 0=never/hardly ever to 4=always. Total scores were calculated by summing the items. Total scores ranged from 0 to 12, with higher scores indicating more social support.

Work attitude was measured with the Work Involvement Scale (WIS)[36], Dutch version. Response options ranged from 0=strong disagree to 3=strong agree. Total scores were calculated by summing the scores on each item, divided by the number of items and then multiplying by 33. Total scores ranged from 0 to 100, with higher scores indicating more positive attitudes towards work.

A changed meaning of work was based on a self-formulated question "Did you changed your meaning of work after being diagnosed with cancer?" (yes; no). Cancer patients who reported to have a changed meaning of work, received an open question to specify their changed meaning of work. Responses were categorized as "health and family were more important than work"; "I work mainly because work is necessary for financial reasons"; "I am rethinking work: work gives structure, social contribution and happiness".

Statistical analysis

Latent class growth modeling (LCGM) with robust maximum likelihood estimation in Mplus 7.1 was used to identify work functioning trajectories[37]. With LCGM, persons with common growth patterns were taken together to make up a group, and each group was characterized by a common growth pattern that differs from the patterns in other groups[38]. Mplus uses full information maximum likelihood (FIML) to estimate the model, which is currently a highly recommended approach[39]. Several models were tested to identify the best fit model[40,41]. Models with heterogeneous variance were chosen, due to large differences in variance on the WRFQ score between the classes. First, Bayesian information criterion (BIC), Sample-Size Adjusted BIC (ssBIC) and Akaike information criterion (AIC) which measure relative fit of different models were inspected, with lower values indicating better models. Second, the Bootstrapped Likelihood Ratio Test (BLRT) was used to compare K- and K-1-class models. Significant BLRT suggests the K-class model was superior to the K-1-class model[40,41]. Third, entropy was examined to determine latent class separation. Higher entropy (>0.6) indicates

better separation and therefore high certainty in classification[42]. Fourth, the conceptual meaningfulness of the different models was assessed. Addition of a class was only considered meaningful when this class showed a clearly different pattern of change compared to the other classes[41]. Paired-samples *t* test were used to describe the different work functioning trajectories (i.e., increase, decrease or stable trajectory), from baseline to 1 year later, and also between the several adjacent measurement points.

Based on the latent class distribution, each participant was assigned to one trajectory class in the following analyses in SPSS 23 for Windows. ANOVA and χ^2 analyses were performed to examine the univariate relationship between baseline socio-demographic, health-related and work-related variables on work functioning trajectory. Variables that showed a significant association with the trajectories were included in a multinomial regression model, adjusted for age, gender, cancer site and type of treatment. In addition, categories that contain a 0 were set as missing. Results were considered to be statistically significant if $p<0.05$.

Results

Sample description

Cancer patients (*n*=324, 65% women) had a mean age of 50.7 (*SD*=8.5) years (Table 1, column "Analytic sample"). Breast cancer was most prevalent (51%) followed by gastrointestinal cancer (14%). Three quarters of the cancer patients received systemic therapy and 63% had completed their treatment. The majority of the sample (79%) reported excellent to good general health and fatigue and depressive symptom scores were low. Two-thirds of the participants reported work accommodations, most often working fewer hours/week and working with an adjusted work schedule.

Excluded participants (*n*=60) were less likely to be diagnosed with breast cancer (51% analytic sample vs. 25% excluded sample) and had more often received surgery (14% vs. 26%) (Supporting Information, Table I). They reported slightly higher scores on depressive symptoms and more often fair or poor self-rated health.

Work functioning trajectories in cancer patients

The 5-class model had the lowest BIC, ssBIC and AIC, but contained a small group (4%, *n*=12) (Table 2). When comparing the 3- and 4-class model, the extra class of the 4-class model showed the same pattern of change compared to the other classes. So based on the conceptual meaningfulness, the 3-class model was preferred over the 4-class model. Table 3 and Figure 1 present the three work functioning trajectories. Trajectory 1 (*n*=52, 16% of the sample) showed high work functioning at baseline (*M*=93.1, *SD*=7.3) and a statistically significant increase in work functioning in the 12 months after RTW ($\Delta_{0\text{-}12}$=5.8, CI95%=3.5-8.2). Cancer patients in this trajectory showed a statistically significant increase in work functioning in the first 9 months ($\Delta_{0\text{-}9}$=6.6, CI95%=4.3-9.0) and remained stable between the other time points. This trajectory was called "persistently high work functioning" because work functioning was high during the first year after RTW. Trajectory 2 (*n*=168, 52% of the sample) showed moderate work functioning at baseline (*M*=82.7, *SD*=12.9) with a statistically significant increase to high work functioning in the 12 months after RTW ($\Delta_{0\text{-}12}$ =7.9, CI95%=5.4-10.5). Cancer patients in this trajectory showed a statistically significant increase in work functioning in the first 6 months ($\Delta_{0\text{-}6}$=7.5, CI95%=5.3-9.7) and remained stable between the other time points. This trajectory was called "moderate to high work functioning" because work functioning was on a moderate level when returning to work and increased to high work functioning during the first year after RTW. Trajectory 3 (*n*=104, 32% of the sample) showed low work functioning at baseline (*M*=66.1, *SD*=16.5) and a statistically significant increase in work functioning in the 12 months after RTW ($\Delta_{0\text{-}12}$ =5.9, CI95%=1.7-10.1). Cancer patients in this trajectory showed a statistically significant increase between 6 and 9 months ($\Delta_{6\text{-}9}$ M=5.5, CI95%=1.4-9.5) and remained stable between the other time points. This trajectory was called "persistently low work functioning" because even though there was an increase in work functioning, the level of work functioning stays low during the first year after RTW.

Table 1. Univariate analysis of work functioning trajectory and baseline variables (*n*=324)

	Analytic sample (*n*=324, 100%)	**Persistently high WF (*n*=52, 16%)**	**Moderate to high WF (*n*=168, 52%)**	**Persistently low WF (*n*=104, 32%)**	**p-value**
Socio-demographic variables					
Age in years, *M* (*SD*)	50.7 (8.5)	50.6 (9.8)	51.3 (7.8)	50.0 (9.0)	0.49[a]
Gender (female), *n* (%)	221 (65)	37 (71)	106 (63)	68 (65)	0.57[b]
Level of education, *n* (%)					
Low	91 (28)	20 (39)	48 (29)	23 (22)	0.26[b]
Medium	108 (34)	17 (33)	53 (32)	38 (37)	
High	124 (38)	15 (29)	66 (40)	43 (41)	
Marital status, *n* (%)					
Married/cohabitating	259 (80)	41 (79)	135 (81)	83 (80)	0.95[b]
Single/divorced/separated	64 (20)	11 (21)	32 (19)	21 (20)	
Health-related variables					
Cancer site, *n* (%)					
Breast cancer	163 (51)	28 (54)	81 (49)	54 (52)	0.70[b]
Gastrointestinal cancer	46 (14)	9 (17)	20 (12)	17 (16)	
Gynecological cancer	9 (3)	1 (2)	4 (2)	4 (4)	
Hematological cancer	34 (11)	5 (10)	16 (10)	13 (13)	
Skin cancer	10 (3)	2 (4)	6 (4)	2 (2)	
Head and neck cancer	13 (4)	3 (6)	7 (4)	3 (3)	
Urogenital cancer	32 (10)	4 (8)	22 (13)	6 (6)	
Lung cancer	10 (3)	0 (0)	6 (4)	4 (4)	
Other cancer	6 (2)	0 (0)	5 (3)	1 (1)	
Type of treatment, *n* (%)					
Surgery	44 (14)	8 (16)	25 (15)	11 (11)	0.56[b]
Radiotherapy exclusively, or in combination with surgery	40 (12)	9 (17)	20 (12)	11 (11)	
Systemic therapy* exclusively or in combination with radiotherapy and/or surgery	237 (73)	34 (67)	123 (73)	80 (78)	
Treatment completed (yes), *n* (%)	203 (63)	31 (60)	108 (64)	64 (62)	0.80 [b]
Treatment side effects (yes), *n* (%)	238 (74)	33 (64)	124 (74)	81 (80)	0.16[b]
General health, *n* (%)					
Excellent-good	251 (79)	47 (90)	130 (79)	74 (73)	0.04 [b]
Fair-poor	68 (21)	5 (10)	35 (21)	28 (28)	
Quality of life, *M* (*SD*)	87.4 (10.3)	90.3 (9.6)	88.8 (9.1)	83.6 (11.4)	<0.01[a]
Co-morbidity (yes), *n* (%)	138 (43)	18 (35)	70 (42)	50 (48)	0.26[b]
Cognitive symptoms, *M (SD)*	24.3 (15.6)	13.1 (10.8)	21.8 (13.7)	34.0 (15.2)	<0.01[a]
Fatigue, *M (SD)*	29.8 (11.3)	23.6 (10.9)	29.2 (10.7)	33.9 (10.7)	<0.01[a]
Depressive symptoms, *M (SD)*	4.5 (3.4)	2.3 (3.5)	4.1 (3.0)	6.2 (3.6)	<0.01[a]
Time between diagnosis and RTW (in months), *M (SD*)	7.5 (6.3)	5.4 (4.3)	7.3 (5.5)	8.9 (7.8)	<0.01[a]

	Analytic sample (*n*=324, 100%)	Persistently high WF (*n*=52, 16%)	Moderate to high WF (*n*=168, 52%)	Persistently low WF (*n*=104, 32%)	p-value
Work-related variables					
Job title, *n* (%)					
Managers	27 (9)	6 (12)	13 (8)	8 (9)	0.84[b]
Professionals	61 (20)	8 (16)	35 (22)	18 (20)	
Technicians and Associate Professionals	50 (17)	8 (16)	23 (15)	19 (21)	
Clerical Support Workers	78 (26)	15 (30)	42 (27)	21 (23)	
Services and Sales Workers	40 (13)	6 (12)	19 (12)	15 (17)	
Craft and Related Trades Workers	21 (7)	2 (4)	12 (8)	7 (8)	
Plant and Machine Operators and Assemblers	10 (3)	3 (6)	6 (4)	1 (1)	
Elementary Occupations	12 (4)	2 (4)	8 (5)	2 (2)	
Job type, *n* (%)					
Manual	37 (12)	10 (20)	19 (11)	8 (8)	0.03[b]
Nonmanual	186 (58)	21 (41)	95 (57)	70 (67)	
Both manual and nonmanual	99 (31)	20 (39)	53 (32)	26 (25)	
Working hours (per week), *M* (*SD*)	18.9 (8.6)	19.5 (9.2)	20.1 (9.0)	16.8 (7.1)	0.01[a]
Employment contract, *n* (%)					
Permanent	306 (94)	48 (92)	161 (96)	97 (93)	0.28[b]
Temporary	14 (4)	3 (6)	4 (2)	7 (7)	
Other	4 (1)	1 (2)	3 (2)	0 (0)	
Company size, *n* (%)					
1-9 persons	44 (14)	5 (10)	15 (9)	24 (23)	0.02[b]
10-49 persons	77 (24)	11 (21)	47 (28)	19 (18)	
50-99 persons	34 (11)	2 (4)	20 (12)	12 (12)	
100-499 persons	82 (25)	16 (31)	42 (25)	24 (23)	
500+ persons	87 (27)	18 (35)	44 (26)	25 (24)	
Tenure with current employer, *n* (%)					
≤5 years	55 (17)	6 (12)	25 (15%)	24 (23)	0.11[b]
>5 years	269 (83)	46 (89)	143 (85)	80 (77)	
Breadwinner status, *n* (%)					
Yes	181 (56)	28 (54)	95 (57)	58 (56)	0.84[b]
No	107 (32)	19 (37)	56 (33)	32 (31)	
Equal with partner	35 (11)	5 (10)	16 (10)	14 (14)	
Reason for RTW, *n* (%)					
Treatment completed and/or	88 (27)	20 (39)	44 (26)	24 (24)	0.11[b]
healthy	23 (7)	0 (0)	11 (7)	12 (12)	
Economic or pushed by others	190 (59)	29 (56)	100 (60)	61 (60)	
Structure, back to normal, colleagues	20 (6)	3 (6)	12 (7)	5 (5)	
Other reasons					
Perception RTW moment, *n* (%)					
Right moment	283 (88)	50 (96)	151 (90)	82 (80)	<0.001[b]
Too early	37 (12)	2 (4)	14 (8)	21 (20)	
Too late	3 (1)	0 (0)	3 (2)	0 (0)	

	Analytic sample (*n*=324, 100%)	Persistently high WF (*n*=52, 16%)	Moderate to high WF (*n*=168, 52%)	Persistently low WF (*n*=104, 32%)	p-value
Work accommodations (yes), *n* (%)	202 (63)	23 (45)	107 (64)	72 (70)	0.01[b]
Type of work accommodation, *n* (%)					
Fewer working hours	178 (55)	21 (40)	93 (55)	64 (62)	0.04[b]
More breaks, flexible/other	95 (29)	12 (23)	42 (25)	41 (39)	0.02[b]
schedule	48 (15)	4 (8)	23 (14)	21 (20)	0.10[b]
Less physical demands	63 (19)	4 (8)	33 (20)	26 (25)	0.04[b]
Other function or tasks	33 (10)	2 (4)	18 (11)	13 (13)	0.23[b]
Other work accommodation					
RTW with same employer (yes), *n* (%)	317 (99)	51 (100)	165 (99)	101 (99)	0.74[b]
RTW with same colleagues, *n* (%)					
Same	203 (63)	36 (72)	110 (66)	57 (56)	0.05[b]
Same and others	102 (32)	13 (26)	53 (32)	36 (35)	
Others	14 (4)	1 (2)	4 (2)	9 (9)	
Social support colleagues, *M* (*SD*)	5.7 (1.8)	6.3 (1.7)	5.6 (1.8)	5.5 (1.8)	0.02[a]
Social support supervisor, *M* (*SD*)	5.3 (2.1)	5.8 (1.8)	5.3 (2.1)	5.0 (2.1)	0.09[a]
Sense of community, M (SD)	10.2 (1.8)	10.6 (1.7)	10.3 (1.8)	9.9 (1.8)	0.06[a]
Work attitude, *M* (*SD*)	71.1 (17.4)	74.4 (15.5)	73.4 (15.3)	65.6 (20.0)	0.001[a]
Meaning of work changed (yes), *n* (%)	166 (52)	10 (19)	87 (53)	69 (68)	<0.01[b]
Meaning of work changed, how? *n* (%)					
Health and family more important	111 (68)	6 (60)	58 (70)	47 (67)	0.11[b]
Necessary for finances	8 (5)	0 (0)	1 (1)	7 (10)	
Rethinking work: structure, social contribution, happiness	34 (21)	4 (40)	17 (21)	13 (19)	
Other	10 (6)	0 (0)	7 (8)	3 (4)	

M=mean; SD=standard deviation; WF=work functioning; RTW=return to work.
**Systemic therapy is defined as 'chemotherapy, immunotherapy, hormonal therapy, stem cell transplantation and/or bone marrow transplantation'.*
[a] ANOVA for continuous outcomes; [b] χ^2 for categorical outcomes.

Table 2. Goodness-of-fit indicator values for each model class

Model	BIC	ssBIC	AIC	E	BLRT (df)	Cancer patients in each group, *n* (%)				
						1	2	3	4	5
1-class	12173.7	12141.9	12135.6	1		324 (100)				
2-class	11187.7	11121.1	11108.3	0.91	1049.6***	163 (50)	161 (50)			
3-class	**10803.0**	**10701.5**	**10682.0**	**0.92**	**448.3*** **	**52 (16)**	**168 (52)**	**104 (32)**		
4-class	10630.6	10494.2	10468.0	0.90	236.0***	81 (25)	126 (39)	76 (23)	41 (13)	
5-class	10628.4	10457.2	10424.3	0.90	65.7***	12 (4)	120 (37)	78 (24)	73 (23)	41 (13)

BIC=Bayesian information criterion; ssBIC=Sample-Size Adjusted BIC; AIC=Akaike information criterion; E=Entropy; BLRT=Bootstrapped Likelihood Ratio Test.
*The preferred 3-class model is presented in bold. *p<0.05; **p<0.01; ***p<0.001.*

Table 3. Work functioning scores over time in cancer patients for the three work functioning trajectories and the entire analytic sample (*n*=324)

Work functioning	Baseline (*M, SD*)	3 months after RTW (*M, SD*)	6 months after RTW (*M, SD*)	9 months after RTW (*M, SD*)	12 months after RTW (*M, SD*)
Persistently high WF (n=52, 16%)	93.1 (7.3)	98.0 (2.3)	98.9 (1.5)	99.6 (0.7)	99.3 (1.0)
Moderate to high WF (n=168, 52%)	82.7 (12.9)	88.2 (7.2)	89.8 (6.3)	90.9 (5.6)	90.2 (6.8)
Persistently low WF (n=104, 32%)	66.1 (16.5)	65.9 (15.5)	63.2 (19.3)	70.3 (15.4)	72.0 (15.1)
Analytic sample (n=324, 100%)	78.9 (16.6)	82.6 (15.8)	82.7 (18.2)	85.9 (14.4)	85.9 (14.0)

M=mean; SD=standard deviation; WF=work functioning; RTW=return to work.

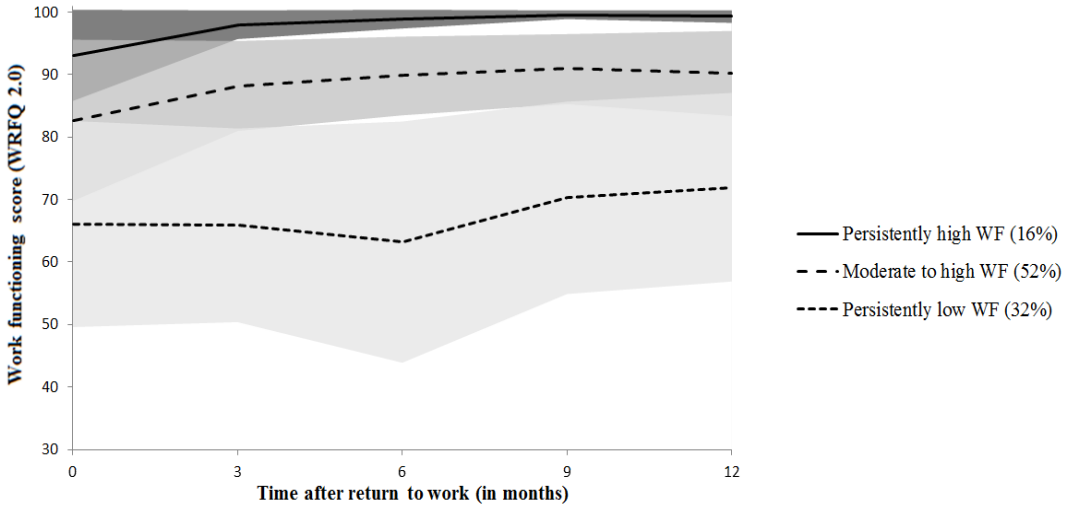

Figure 1. Work functioning trajectories, mean and standard deviation (*n*=324).
WF=work functioning, WRFQ 2.0=work role functioning questionnaire 2.0

Univariate associations of socio-demographic, health-related and work-related variables with work functioning trajectories

No gender, age or educational differences across work functioning trajectories were found. Similarly, cancer diagnosis, cancer treatment and treatment completion were not associated with any work functioning trajectory.

Cancer patients with persistently high work functioning reported less time between diagnosis and RTW and more often excellent to good health than cancer patients in the other trajectories (Table 1). They worked more often in a manual job and experienced more social support from colleagues. In addition, they reported less often a changed meaning of work after cancer diagnosis.

Cancer patients with persistently low work functioning reported more cognitive symptoms than cancer patients in the other trajectories. They also reported more depressive symptoms and fatigue, however, the depression and fatigue scores were all below clinical cutoff points[43,44]. In addition, they worked fewer hours per week, more often reported work accommodations and perceived the moment of RTW as too early.

Multivariate associations of socio-demographic, health-related and work-related variables with work functioning trajectories

Multivariate analyses showed that cancer patients with persistently high work functioning had less time between diagnosis and RTW (Table 4). In addition, they were less likely to have a changed meaning of work after cancer diagnosis than cancer patients in the other trajectories. Cancer patients with persistently low work functioning reported more cognitive symptoms than cancer patients in the other trajectories.

Table 4. Multivariate analysis of work functioning trajectory and baseline variables (*n*=246)

	Comparison between 'persistently high' and 'persistently low' WF	Comparison between 'persistently high' and 'moderate to high' WF	Comparison between 'moderate to high' and 'persistently low' WF
	OR (95%CI)	**OR (95%CI)**	**OR (95%CI)**
General health			
Fair-poor	0.38 (0.05-3.06)	0.15 (0.02-0.96)*	2.60 (0.85-7.89)
Excellent-good	Reference	Reference	Reference
Quality of life	1.01 (0.93-1.09)	0.95 (0.88-1.02)	1.06 (1.01-1.12)*
Cognitive symptoms	0.87 (0.82-0.92)***	0.92 (0.87-0.97)**	0.95 (0.92-0.98)***
Fatigue	0.97 (0.90-1.05)	1.00 (0.93-1.07)	0.98 (0.93-1.03)
Depressive symptoms	0.72 (0.52-0.99)*	0.71 (0.53-0.96)*	1.01 (0.87-1.18)
Time between diagnosis and RTW	0.83 (0.71-0.96)**	0.83 (0.72-0.95)**	1.00 (0.95-1.07)
Job type			
Manual	8.08 (0.96-68.25)	3.34 (0.57-19.63)	2.42 (0.57-10.23)
Both manual and nonmanual	3.66 (0.89-15.05)	1.88 (0.55-6.41)	1.95 (0.80-4.75)
Nonmanual	Reference	Reference	Reference
Working hours	0.97 (0.89-1.05)	0.94 (0.87-1.00)	1.03 (0.98-1.09)
Company size			
1-9 persons	0.23 (0.03-1.70)	0.74 (0.11-4.81)	0.32 (0.09-1.11)
10-49 persons	0.27 (0.05-1.64)	0.11 (0.02-0.55)**	2.41 (0.84-6.96)
50-99 persons	0.04 (0.00-0.93)*	0.06 (0.00-1.07)	0.74 (0.21-2.64)
100-499 persons	0.78 (0.16-3.85)	0.47 (0.12-1.89)	1.65 (0.61-4.47)
500+ persons	Reference	Reference	Reference
Perception RTW moment			
Too early	0.55 (0.05-6.01)	1.07 (0.10-11.11)	0.51 (0.16-1.61)
Right moment	Reference	Reference	Reference
Work accommodations			
No	1.65 (0.43-6.32)	2.19 (0.67-7.14)	0.76 (0.32-1.77)
Yes	Reference	Reference	Reference
RTW with same colleagues			
Others	9.06 (0.13-611.58)	1.19 (0.02-78.34)	7.59 (0.7.59-72.87)
Same and others	3.34 (0.04-260.53)	0.59 (0.01-43.80)	5.65 (0.56-57.41)
Same	Reference	Reference	Reference
Social support colleagues	1.28 (0.83-1.98)	1.36 (0.91-2.02)	0.95 (0.76-1.18)
Work attitude	1.03 (0.99-1.07)	1.02 (0.98-1.05)	1.02 (1.00-1.04)
Meaning of work changed			
Yes	0.06 (0.06-0.24)***	0.10 (0.03-0.37)***	0.57 (0.26-1.25)
No	Reference	Reference	Reference

M=mean; SD=standard deviation; OR=Odds Ratio; CI=Confidence Interval; WF=work functioning; RTW=return to work.
**p<0.05; **p<0.01; ***p<0.001.*

Discussion

This is the first study to examine work functioning trajectories in cancer patients. Three distinct work functioning trajectories in the year following return to work (RTW) were identified; 1) “persistently high work functioning” (16% of the sample), 2) “moderate to high work functioning” (54% of the sample) and 3) “persistently low work functioning” (32% of the sample). Cognitive symptoms, time between diagnosis and RTW and changed meaning of work were associated with work functioning trajectories. Cancer site and treatment were not associated with any work functioning trajectory.

High baseline work functioning was indicative of persistently high work functioning in the year following return to work of cancer patients. Furthermore, patients who reported moderate work functioning at baseline were likely to improve to high work functioning. While two-thirds of the cancer patients had these high work functioning trajectories in the year following RTW, one-third had persistently low work functioning trajectories, indicating that RTW is not always an optimal RTW. Cancer patients who reported low work functioning at baseline were likely to remain low in work functioning, although there was heterogeneity in their work functioning patterns.

Cancer patients in the persistently high work functioning trajectory needed less time to RTW after cancer diagnosis. In addition, they reported good-to-excellent health more often than cancer patients in the other two trajectories. Previous research stated that workers in the general working population who reported good to excellent health had higher levels of work functioning compared to workers who reported poor to fair health[25]. We extended this finding by showing that cancer patients in good-to-excellent health showed persistently high work functioning over time.

Cancer patients in the persistently high work functioning trajectory reported higher social support from colleagues compared to cancer patients in the other trajectories. This might indicate that for cancer patients with persistently high work functioning, social support from colleagues was important. Previous literature about the relationship between social support from the supervisor and work outcomes showed that less supervisor social support was associated with poor work outcomes in breast cancer patients[45], but this association was not found in this study. Further research is needed on social support of both colleagues and supervisor with work functioning in cancer patients.

Earlier, we showed that work had become less important to cancer patients[18]. This study supports our previous findings. The majority of the cancer patients revalued the meaning of work, whereby most cancer patients valued their work as less important shortly after return to work compared to the situation before cancer diagnosis. In addition, this study showed that cancer patients in the persistently high work functioning trajectory revalued the meaning of their work less often, which possibly indicates that they care more about their level of work functioning. Future studies need to address the changes in meaning of work over time.

Cancer patients with persistently low work functioning in the year following RTW experienced more cognitive symptoms at baseline. These results align with previous research showing that cognitive symptoms cause difficulties at work for cancer survivors[46]. The chemotherapy-related change in cognitive function model describes two distinct and interacting pathways for cognitive impairments in cancer patients[47]. Cognitive impairment might result directly from the neurotoxic effects of cancer treatment[48,49] and/or indirectly from symptoms of anxiety, stress, distress and depression related to the cancer diagnosis.

This study showed no association between cancer site and cancer treatment with any work functioning trajectory. Recently, Duijts et al. also found no differences in cancer site and treatment for cancer patients who are “continuously working” or “not-continuously working” 4 years after diagnosis[12]. A possible explanation for our findings is that cancer patients in WOLICA have relatively good (treatment) outcomes, while cancer patients who are very restricted by their diagnosis or treatment will probably not return to work. Fatigue and depressive symptoms were not or marginally related with any trajectory. Our findings therefore support that cognitive symptoms are a main driver for work functioning. For future research, it is recommended to examine the changes in symptoms over time and to investigate how these changes relate with changes in work functioning over time. In addition to this, we found that cancer patients with nonmanual jobs, characterized by mental (i.e., cognitive and emotional) demands, had more often persistently low work functioning. Further research is required to investigate the specific problems and barriers to work functioning of cancer patients employed in nonmanual jobs.

Overall, a large majority of the WOLICA sample reported excellent-to-good general health and fatigue and depressive symptom scores were below the cutoff of clinical disorders[43,44]. This might be explained by the inclusion criterion of work resumption for at

least 12 hr/week. In addition, the mean working hours/week in this sample was *M*=18.9. Cancer patients with poor health might not be able to resume work and therefore did not participate. Another explanation might be response shift. During the course of their disease, cancer patients might have accepted their limitations to some extent and, consequently, rate their health and/or work functioning as improved, while their actual health condition and/or level of work functioning did not change[50].

Our results have implications for cancer care and guidance of cancer patients at work. First, cancer site and cancer treatment might be less important for managing work functioning of cancer patients who are back at work. Second, clinicians should assess cognitive symptoms to help manage a cancer patient's RTW. This information can be used as starting point for a dialogue with cancer patients, to intervene and improve their cognitive functioning at work if needed. Third, OP's should assess work functioning as soon as possible in the RTW process. Our results show that cancer patients with low levels of work functioning at RTW are likely to stay low during the first 12 months. Cancer patients with low work functioning scores might therefore benefit more from early intervention and intensive guidance targeted at improving work functioning. The WRFQ might be a helpful tool as it is viewed as valuable by OPs to assess and monitor work functioning during a regular visit in the RTW process. More research is needed to develop interventions to improve the work functioning of cancer patients with low work functioning scores when returning to work.

A study strength is the longitudinal design with repeated measurements of work functioning at baseline and 3, 6, 9 and 12 months post baseline, which enabled investigating the course of work functioning in the year following RTW. Another strength is the heterogeneous sample containing cancer patients with different cancer sites and treatments. The absence of information about cancer patients who were not asked to participate or were asked but not willing to participate is a limitation of the study. Consequently, it is unknown if the study sample is representative of patients who resumed work after cancer diagnosis and treatment. The results need to be interpreted with caution because of the relatively small sample size. In addition, the underrepresentation of cancer patients employed in manual work has to be taken into account when interpreting the results. However, this is one of the first studies with a novel outcome that goes beyond employment status in cancer patients, which makes it important for both the individual and the society as whole. It should also be taken into account that this study is based on self-reported data and future studies using more

objective data (e.g., medical records on stage at diagnosis and treatment type) are needed. However, in the absence of administrative data sources, self-reported information about lifestyle behavior and subjective appraisal of quality of life is an important method of data collection in cancer patients[51]. Another limitation is the lack of information about work functioning prior to the cancer diagnosis.

To conclude, three distinct work functioning trajectories in the year following RTW after cancer diagnosis were identified. Two-thirds of the cancer patients reported persistently high work functioning or moderate to high work functioning in the year following RTW. One-third of cancer patients showed persistently low work functioning, particularly those experiencing cognitive symptoms and changed meaning of work.

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Supporting Information, Table I. Characteristics of the analytic sample (*n*=324) and excluded sample (*n*=60).

	Analytic sample (*n*=324)	**Excluded sample (*n*=60)**
Socio-demographic variables		
Age in years, *M* (*SD*)	50.7 (8.5)	50.4 (8.7)
Gender (female), *n* (%)	221 (65)	32 (53)
Level of education, *n* (%)		
Low	91 (28)	14 (23)
Medium	108 (34)	21 (35)
High	124 (38)	25 (42)
Marital status, *n* (%)		
Married/cohabitating	259 (80)	47 (78)
Single/divorced/separated	64 (20)	13 (22)
Health-related variables		
Cancer site, *n* (%)		
Breast cancer	163 (51)	15 (25)*
Gastrointestinal cancer	46 (14)	12 (20)
Gynecological cancer	9 (3)	3 (5)
Hematological cancer	34 (11)	8 (13)
Skin cancer	10 (3)	6 (10)
Head and neck cancer	13 (4)	2 (3)
Urogenital cancer	32 (10)	9 (15)
Lung cancer	10 (3)	3 (5)
Other cancer	6 (2)	2 (3)
Type of treatment*, *n* (%)		
Surgery	44 (14)	15 (26)*
Radiotherapy exclusively, or in combination with surgery	40 (12)	8 (14)
Systemic therapy* exclusively or in combination with radiotherapy and/or surgery	237 (73)	34 (60)
Treatment completed, (yes) *n* (%)	203 (63)	44 (73)
Treatment side effects (yes), *n* (%)	238 (74)	42 (70)
General health, *n* (%)		
Excellent-good	251 (79)	40 (67)*
Fair-poor	68 (21)	20 (33)
Quality of life, *M* (*SD*)	87.4 (10.3)	85.6 (12.0)
Co-morbidity (yes), *n* (%)	138 (43)	28 (47)
Cognitive symptoms, *M (SD)*	24.3 (15.6)	28.3 (17.2)
Fatigue, *M (SD)*	29.8 (11.3)	32.6 (11.1)
Depressive symptoms, *M (SD)*	4.5 (3.4)	5.5 (4.8)*
Time between diagnosis and RTW (in months), *M (SD*)	7.5 (6.3)	6.4 (5.1)

	Analytic sample (*n*=324)	Excluded sample (*n*=60)
Work-related variables		
Job title, *n* (%)		
Managers	27 (9)	6 (11)
Professionals	61 (20)	11 (20)
Technicians and Associate Professionals	50 (17)	10 (18)
Clerical Support Workers	78 (26)	11 (20)
Services and Sales Workers	40 (13)	6 (11)
Craft and Related Trades Workers	21 (7)	3 (6)
Plant and Machine Operators and Assemblers	10 (3)	5 (9)
Elementary Occupations	12 (4)	3 (6)
Job type, *n* (%)		
Manual	37 (12)	9 (15)
Nonmanual	186 (58)	34 (57)
Both manual and nonmanual	99 (31)	17 (28)
Working hours (per week), *M* (*SD*)	18.9 (8.6)	19.1 (8.0)
Employment contract, *n* (%)		
Permanent	306 (94)	57 (95)
Temporary	14 (4)	2 (3)
Other	4 (1)	1 (2)
Company size, *n* (%)		
1-9 persons	44 (14)	9 (15)
10-49 persons	77 (24)	14 (23)
50-99 persons	34 (11)	7 (12)
100-499 persons	82 (25)	19 (32)
500+ persons	87 (27)	11 (18)
Tenure with current employer, *n* (%)		
≤5 years	55 (17)	12 (20)
>5 years	269 (83)	48 (80)
Breadwinner, *n* (%)		
Yes	181 (56)	33 (55)
No	107 (32)	20 (33)
Equal with partner	35 (11)	7 (12)
Reason for RTW, *n* (%)		
Treatment completed and/or healthy	88 (27)	17 (30)*
Economic reasons, pushed by others	23 (7)	5 (9)
Structure, back to normal, colleagues	190 (59)	25 (45)
Other reasons	20 (6)	9 (16)
Perception RTW moment, *n* (%)		
Right moment	283 (88)	46 (78)
Too early	37 (12)	12 (20)
Too late	3 (1)	1 (2)
Work accommodations (yes), *n* (%)	202 (63)	40 (69)
Type of work accommodation, *n* (%)		
Fewer working hours	178 (55)	34 (57)
More breaks, flexible/other schedule	95 (29)	17 (28)
Less physical demands	48 (15)	14 (23)
Other function or tasks	63 (19)	11 (18)
Other work accommodation	33 (10)	4 (7)

	Analytic sample (*n*=324)	**Excluded sample (*n*=60)**
RTW with same employer (yes), *n* (%)	317 (99)	58 (97)
RTW with same colleagues, *n* (%)		
Yes	203 (63)	40 (68)
Same and others	102 (32)	13 (22)
Others	14 (4)	6 (10)
Social support colleagues (range 0-8), *M* (*SD*)	5.7 (1.8)	5.4 (1.9)
Social support supervisor (range 0-8), *M* (*SD*)	5.3 (2.1)	5.3 (2.3)
Sense of community (range 0-10), *M* (*SD*)	10.2 (1.8)	9.8 (2.5)
Work attitude, *M* (*SD*)	11.1 (3.2)	11.8 (3.2)
Meaning of work changed (yes), *n* (%)	167 (52)	25 (44)
Meaning of work changed, how? *n* (%)		
Health and family more important	111 (68)	22 (85)
Necessary for finances	8 (5)	1 (4)
Rethinking work: structure, social contribution, happiness	34 (21)	3 (12)
Other	10 (6)	0 (0)

M=mean; SD=standard deviation; RTW=return to work.
**Systemic therapy is defined as 'chemotherapy, immunotherapy, hormonal therapy, stem cell transplantation and/or bone marrow transplantation'.*
**p<0.05; **p<0.01; ***p<0.001, ANOVA for continuous outcomes; χ^2 for categorical outcomes.*